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RESEARCH ARTICLES

The Relationship between Calorie and Protein Adequacy and Malnutrition Status in Hemodialysis Patients at Lestari Kidney Clinic Semarang

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Abstract: Hemodialysis patients have several side effects from treatment, including possible malnutrition due to their decreased nutritional status. Malnutrition in hemodialysis patients can occur due to increased protein catabolism, loss of nutrients during the dialysis process, and impaired food intake due to anorexia, nausea, and vomiting. The purpose of this study was to determine the relationship between calorie and protein adequacy and malnutrition status in hemodialysis patients at the Lestari Kidney Clinic Semarang. This study uses a quantitative design of observational analytics with a cross-sectional approach. The research sample of 47 hemodialysis patients at the Lestari Kidney Clinic Semarang in 2025 was selected using a purposive sampling method that met the inclusion and exclusion criteria. Calorie and protein adequacy measurements were carried out using the 3x24-hour food recall method, while malnutrition status was assessed using the Dialysis Malnutrition Score (DMS). Data analysis was carried out with the Spearman Rank test to see the relationship between calorie and protein adequacy and malnutrition status. The analysis showed a significant relationship between calorie adequacy and malnutrition status ($p = 0.034$, $r = -0.310$) and protein adequacy with malnutrition status ($p = 0.020$, $r = -0.338$). The association showed a negative correlation with weak correlation strength, meaning the higher the calorie and protein adequacy, the lower the patient's malnutrition score. There was a relationship between calorie and protein adequacy and malnutrition status in hemodialysis patients at the Lestari Kidney Clinic.

Keywords: Calorie adequacy, protein adequacy, malnutrition, hemodialysis

INTRODUCTION

Hemodialysis patients may have a number of side effects from treatment, including possible malnutrition due to their decreased nutritional status. Hemodialysis patients suffering from malnutrition

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experience severe muscle loss due to a lack of energy and protein.[1] Malnutrition is common in patients undergoing hemodialysis, with 20% to 70% of those undergoing haemodialysis developing this condition.[2] Severe malnutrition occurs in 6% to 8% of hemodialysis patients, while mild malnutrition occurs in 30% to 65% of patients.[3] Based on data from the Report Of Indonesian Renal Registry (2017), the number of new patients undergoing hemodialysis on an annual basis continues to increase, with 30,831 new patients receiving hemodialysis therapy and 77,892 people still receiving it. The majority of patients discontinued hemodialysis therapy due to their death, with 4,021 people (70%) discontinuing treatment.[4] In Central Java province, there are 2488 new patients undergoing hemodialysis and are among the 3rd largest proportions.[5]

Protein Energy Wasting (PEW), Malnutrition Inflammation Atherosclerosis Syndrome (MIA) and Malnutrition Inflammation Complex Syndrome (MICs) are other names for malnutrition.[2] Hemodialysis increases protein catabolism, PEW is common in hemodialysis patients. The nutritional intake of hemodialysis patients can also be affected by uremia symptoms such as anorexia, nausea, and vomiting.[6] PEW is defined by a constant loss of protein and energy fuel stores in the body, which is induced by different dietary and metabolic variables.[7] Inadequate dietary protein intake is a frequent and important cause of PEW in patients undergoing hemodialysis.[8] Various mechanisms can lead to the state of PEW, such as uremic toxicity, inflammation and insufficient protein intake.[9] PEW in hemodialysis patients can be affected by iatrogenic variables, such as the length of dialysis, the inflammatory response caused by dialysis, and nutrient loss from the procedure. non-iatrogenic elements such as insufficient food consumption, taste changes, hunger suppression, and psychological elements that affect physiological processes.[2]

Based on the latest guidelines released by the Kidney Disease Outcomes Quality Initiative (KDOQI), a comprehensive nutrition assessment by Registered Dietitian Nutritionists (RDN) is recommended within the first 90 days of dialysis initiation, annually, and when referred by a physician. The Malnutrition Inflammation Score (MIS) and the Subjective Global Assessment (SGA) are considered reliable instruments for the thorough nutritional evaluation of hemodialysis patients. Although MIS is accurate in detecting PEW, the use of this method for routine nutritional screening may be impractical because it is time-consuming and requires expert judgment, especially by RDNs. Therefore, a simpler but valid tool is needed to ensure timely PEW diagnosis among patients undergoing hemodialysis.[10] *Dialysis malnutrition score* (DMS) is a nutritional status evaluation method derived from SGA, which is a commonly used method to evaluate the nutritional status of hemodialysis patients.[11]

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Calories are an umbrella term for units of energy in the metric system.[12] Malnutrition can result from too little energy consumption. The use of protein can be influenced to be more effective in preventing the body from using its energy stores if the required daily energy intake of 30 to 35 kcal/kg bb is met. Protein is one of the nutrients that is lost during hemodialysis.[13] It is calculated that 10-12 grams of protein are lost during each hemodialysis session, or 1-2 grams of amino acids are expended per hour of dialysis.[1] The accumulation of protein catabolism in the body causes symptoms of uremic syndrome, protein intake has a significant impact on the management of nutritional status in hemodialysis patients. The better the state of the defensive nutrition, the more protein consumed.[13]

Keep in mind that food serves to ensure the existence and mental well-being of humans. Because it will also have an impact on human behavior and quality of life, it is natural for people to pay attention to the quality of the food they will eat. As a postulate of the Qur'an that has regulated what type of food should be consumed and can be said to be good for consumption and in the future will facilitate its survival,[14] Q.S Al Baqarah ayat 127 :

ا يَٰٓأَيُّهَا ٱلَّذِينَ ءَامَنُواْ كُلُواْ مِن طَيِّبَٰتِ مَا رَزَقۡنَٰكُمۡ وَٱشۡكُرُواْ لِلَّهِ إِن كُنتُمۡ إِيَّاهُ تَعۡ

Meaning: O you who have believed, eat what is good that We have bestowed upon you and give thanks to Allah if you truly worship Him.

The majority of hemodialysis patients suffer from mild malnutrition, based on research conducted on individuals with chronic kidney failure treated with hemodialysis at Dr. Dradjat Prawiranegara Hospital. Another study found that 32 (64%) of 50 hemodialysis patients were malnourished. It is also said that there is a relationship between the nutritional state of GGK patients receiving hemodialysis and their energy and protein intake.[1] Another study found that 32 (64%) of 50 hemodialysis patients were malnourished. It is also said that there is a relationship between the nutritional state of GGK patients receiving hemodialysis and their energy and protein intake.[13] Lestari Kidney Clinic is a specialized clinic to handle hemodialysis.

Based on this background, the researcher wanted to see the relationship between calorie and protein adequacy and malnutrition status in hemodialysis patients at the Lestari Kidney Clinic Semarang.

METHOD

This study uses a type of observational quantitative research with *a cross sectional design.* The population in this study is hemodialysis patients at the Lestari Kidney Clinic in Semarang. The number of samples used in this study is 47 hemodialysis patients at the Lestari Kidney Clinic Semarang in January 2025. The sampling technique used is *purposive sampling.*

The inclusion criteria in this study are hemodialysis patients who are actively

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performing hemodialysis at the Lestari Kidney Clinic in January 2025, hemodialysis patients aged 40-60 years, hemodialysis patients who undergo routine hemodialysis 2 times per week for at least 3 months, hemodialysis patients who are willing to be study respondents. Meanwhile, the exclusion criteria in this study were hemodialysis patients who experienced a decrease in consciousness, hemodialysis patients who experienced depression.

This research took place at the Lestari Kidney Clinic Semarang and was carried out on January 4 – February 5, 2025. The measuring tools used to measure calorie and protein adequacy in this study were *3x24-hour Food recall,* food photo book, and *nutrisurvey application*. Meanwhile, the measuring tool used to measure malnutrition status in this study is *the Dialysis Malnutrition Score* (DMS). The DMS method showed a fairly high sensitivity (94%) and specificity (88%) values when compared to SGA [15]. The data analysis used was descriptive analysis for univariate analysis and *spearman rank* test for bivariate analysis. This research has received a certificate of ethical feasibility from the Health Research Ethics Commission (KEPK) of the Faculty of Medicine, University of Muhammadiyah Semarang on November 21, 2024 with letter number (No.055 / EC / KEPK-FK / UNIMUS / 2024).

RESULT

The results of the study in univariate analysis were to describe the frequency and percentage of characteristics of the repondent and to describe each of the research variables of calorie adequacy, protein adequacy, and malnutrition in hemodialysis patients at the Lestari Kidney Clinic.

Table 1. Respondent Characteristics

Characteristics	Frequency	percentage
Gender		
Man	25	53,2
Woman	22	46,8
Age		
40-50	24	51,1
51-60	23	48,9
Final Education		
Junior High School	2	4,3
Senior High School	14	29,8
Diploma	9	19,1
College	21	44,7
Doctoral	1	2,1
Work		
Un Employee	25	53,2
Housewife	21	44,7
Lector	1	2,1

Table 1 refers to the data of the characteristics of the respondents in the study, the data of the characteristics of the respondents consisted of gender, age, last education, and occupation. The majority of respondents were male as many as 25 (53.2%) respondents. The majority of respondents were around 40-50 years old with a range of 24 (51.1%). The last education taken by the majority of respondents was up to S1 with a total of 21 respondents (44.7%). The majority of respondents did not have a job with a total of 25 respondents (53.2%).

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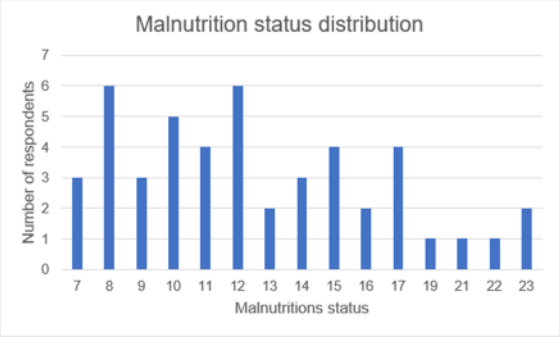
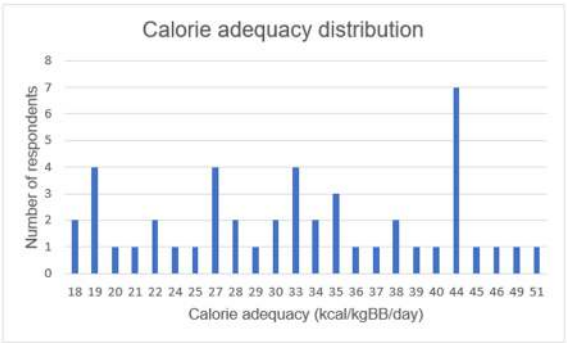
Figure 1. Malnutrition status distribution diagram



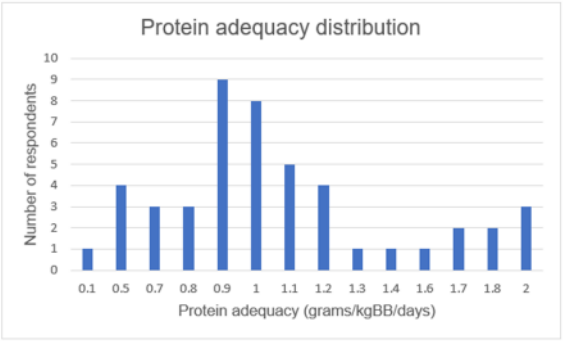
Based on figure 1, the distribution diagram of malnutrition status in hemodialysis patients at the Lestari Kidney Clinic Semarang in 2025 shows the value of malnutrition status from 47 respondents. Overall, this distribution shows that the majority of respondents, as many as 29 respondents (61.70%), are in the range of malnutrition status 7-13 which means they are in a state of good nutrition, while 18 respondents (38.30%) are in the range of malnutrition status 14-23 which is included in mild to moderate malnutrition.

Figure 2. Calorie adequacy distribution diagram



Based on figure 2, a diagram of the distribution of calorie adequacy in hemodialysis patients at the Lestari Kidney Clinic Semarang in 2025 which shows the caloric adequacy value of 47 respondents. The number of respondents who had less than the recommended value was 19 respondents (40.42%). Meanwhile, the number of respondents who had enough calories in accordance with the recommended value was 30-35 kcal/kgBB/day as many as 11 respondents (23.40%). The number of respondents who had calorie adequacy above the recommended value was 17 respondents (36.17%). The majority of respondents, namely 28 respondents (59.57%), had sufficient calorie adequacy compared to the recommended calorie adequacy.

Figure 3. Protein adequacy distribution diagram



Based on figure 3, the distribution diagram of protein adequacy in hemodialysis patients at the Lestari Kidney Clinic Semarang in 2025 shows the protein adequacy value of 47 respondents. The majority of respondents had protein adequacy less than the recommended value as many as 20 respondents (42.55%). Meanwhile, the number of respondents who

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had enough protein in accordance with the recommended value was 1-1.2 grams/kgBB/day as many as 17 respondents (36.17%). The number of respondents who had enough protein above the recommended value was 10 respondents (21.27%).

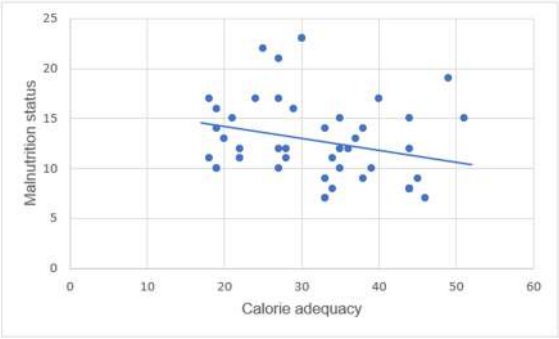
The results of the study in bivariate analysis were to analyze each relationship between calorie adequacy and malnutrition and the relationship between protein adequacy and malnutrition

Table 2. The relationship between calorie adequacy and malnutrition status

Variabel	r	*P value*
Calorie adequacy and malnutrition status	-0,310	0,034

Based on table 2 the relationship between calorie sufficiency and malnutrition status shows the relationship between calorie sufficiency and malnutrition status, the table above shows a significant relationship that can be seen from the *p value* of 0.034 (<0.05) with a correlation coefficient of -0.310, which shows the strength of the correlation of the two weak variables.

Figure 4. Calorie adequacy correlation strength graph



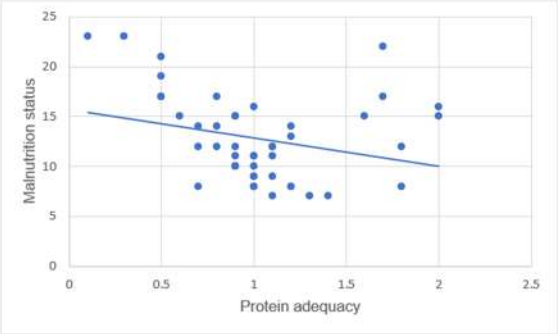
There is a negative relationship between calorie adequacy and malnutrition status. This means that the higher the calorie adequacy, the lower the malnutrition score.

Table 3. The relationship between protein adequacy and malnutrition status

Variabel	r	*P value*
Protein adequacy and malnutrition status	-0,338	0,020

Based on table 3 the relationship between protein adequacy and malnutrition status shows the relationship between protein adequacy and malnutrition status, the table above shows a significant correlation which can be seen from the *p value* of 0.020 (<0.05) with a correlation coefficient of -0.338, which shows the strength of the correlation of the two weak variables.

Figure 5. Protein adequacy correlation strength graph



DISCUSSION

Protein Energy Wasting (PEW) is a disease that often affects hemodialysis patients, this is characterized by a decrease in protein and energy reserves in the body. PEW is influenced by a number of variables, including stress, exercise, eating habits, and protein and energy consumption.[15]

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Insufficient energy intake can lead to malnutrition. In this study, it was found that calorie adequacy was related to malnutrition status with *a p value* of 0.034. This study is in line with research conducted by Dina (2021) which shows that insufficient energy and protein intake is associated with a decrease in nutritional status in hemodialysis patients. A study found that adequate intake of energy, protein, sodium, and fluids is an important factor in improving nutritional status based on *the Dialysis Malnutrition Score* (DMS). Proper nutritional intake can help prevent muscle mass loss and other complications related to PEW.[11]

Malnutrition can result from too little energy consumption. The results of this study found that calorie adequacy was related to malnutrition status with a p value of 0.034. This study is in line with research conducted by Dina (2021) which shows that insufficient energy and protein intake is associated with a decrease in nutritional status in hemodialysis patients. A study found that the Dialysis Malnutrition Score (DMS) shows that improving nutritional status requires adequate intake of energy, protein, salt, and water. Reduced muscle mass and other PEW-related problems can be avoided with proper food consumption.[13] The use of protein can be influenced to be more effective in preventing the body from using its energy stores if the required daily energy intake of 30 to 35 kcal/kg bb is met. Energy metabolism is impaired in hemodialysis patients, resulting in a negative energy balance caused by impaired cellular energy metabolism. In accordance with research conducted by Tony (2020) that hemodialysis patients have a negative energy balance and are prone to malnutrition, which raises concerns about the possibility that they have experienced malnutrition in the past. Patients can maintain body cell mass if they consume the recommended amount of energy.[16]

Hemodialysis patients must consume enough energy to maintain a positive nitrogen balance, which helps them avoid and recover from PEW. In addition, a macronutrient distribution of 25-30% fat and 60-65% daily energy is recommended. Research conducted by Nurhasanah (2021) states that the provision of a diet with this composition aims to meet the energy and nutritional needs of patients, as well as prevent malnutrition.[17] Meeting nutritional needs, preventing malnutrition, and avoiding various problems associated with chronic kidney disease are the main goals of dietary therapy for hemodialysis patients. A healthy nitrogen balance can be achieved and tissue damage and protein catabolism can be avoided with the right amount of energy.[13]

Individuals with PEW often consume insufficient amounts of calories, which worsens the condition, calorie sufficiency is undoubtedly an important component in lowering the risk of PEW.[28] The research results of this study are also in line with research conducted by Tanjina (2022) revealing that the intake of various micronutrients, proteins, and energy is still not optimal can cause PEW.[18]

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The results of this study found a weak correlation between calorie adequacy and malnutrition status with r -0.310 and between protein adequacy and malnutrition status with r -0.338. A weak correlation between calorie and protein adequacy and malnutrition status can occur because many factors affect the status of malnutrition in hemodialysis patients so that it does not only depend on calorie and protein intake. One of them is that potassium intake is also related to malnutrition status, in line with research conducted by Sherly (2021) that there is a relationship between potassium intake and nutritional status in chronic kidney failure patients undergoing hemodysis. Potassium is essential for maintaining electrolyte and water balance as well as acid-base balance. Potassium is involved in the creation of proteins and glycogen as well as energy metabolism within cells.[19]

The results of this study found that protein adequacy was related to malnourishment status with a p value of 0.020. This study is in line with research conducted by Nursyifa (2019) which revealed a decline in nutritional status in hemodialysis patients related to inadequate protein intake. According to a study, patients who consumed enough protein fared better nutritionally than those who didn't. Tissue injury and excessive protein catabolism can be avoided with adequate protein intake.[15]

One of the nutrients lost during hemodialysis is protein, which is lost at a rate of 0.2 to 0.3 g/kg or 6 to 8 g/day. Therefore, a balance is needed for example, hemodialysis patients should receive 1.2 g/kgBB/day of protein to account for protein loss and nitrogen balance during the dialysis process. Since it contains more complete amino acids, it is better to get this protein from animal sources. Since the buildup of protein catabolism in the body causes the symptoms of uremic syndrome, protein intake has a significant impact on the management of nutritional status in hemodialysis patients. The higher the protein intake, the better the defensive nutritional status.[20]

The creation of muscle and the maintenance of body tissues depend on proteins. Wasting tissue and PEW are caused by the body breaking down muscle tissue to meet metabolic needs when protein intake is insufficient.[21] Loss of protein during dialysis and the need to repair tissue damage due to inflammation, hemodialysis patients have a higher protein requirement than the general population. Failure to meet this requirement due to inadequate protein intake can worsen PEW.[22] Consuming enough protein is essential to maintain nitrogen balance. Low protein intake leads to a lack of nitrogen in the body, which can result in loss of muscle and body mass.[21] Hemodialysis patients often experience inflammation, which can increase their protein needs. High levels of inflammation can lead to increased protein metabolism, which means greater dietary needs are required. Adequate protein intake is also important for the performance of the immune system. A lack of protein is able to lower the immune system and increase

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patients' susceptibility to infections, which can exacerbate their nutritional problems and cause PEW.[22]

CONCLUSION

The majority of hemodialysis patients at the Lestari Kidney Clinic Semarang have a good nutritional malnutrition status. The majority of hemodialysis patients at the Lestari Kidney Clinic Semarang have good calorie adequacy and low protein adequacy. Majority There is a weak relationship between calorie sufficiency and malnutrition status, the higher the calorie sufficiency, the lower the malnutrition status and there is a weak relationship between protein sufficiency and malnutrition status, the higher the protein sufficiency, the lower the malnutrition status.

REFERENCES

1. Zulfikar AN, Koerniawati RD, Perdana F. Hubungan Asupan Zat Gizi Makro terhadap Status Gizi Pasien Hemodialisa di RSUD dr. Dradjat Prawiranegara. *J Gizi Kerja dan Produkt*. 2023;4(2):225-234.
2. Mali N, Ge J, Su F, Li C, Fan W. Review of Risk Factors of Malnutrition in Maintenance Hemodialysis Patients. *Arch Nephrol Urol*. 2022;05(01):24-33.
3. Bharati Joyita JV. Achieving dialysis adequacy: A global perspective. *Semin Dial 33*. Published online 2020:78-83.
4. Satti YC, Mistika SR, Imelda L. Faktor-Faktor Yang Mempengaruhi Status Gizi Pasien Hemodialisa Di Rumah Sakit Stella Maris Makassar. *J Keperawatan Florence Nightingale*. 2021;4(1):1-8.
5. Utomo Endrat Kartiko TW. Analisis Faktor Yang Mempengaruhi Kualitas Hidup Pasien Gagal Ginjal Kronis Yang Menjalani Terapi Hemodialisis. *J Keperawatan*. 2024;16(1):383-396.
6. Setiawan I, Purbianto P. Effect of Hemodialysis on Nutritional Status in Chronic Renal Failure Patients. *J Noncommunicable Dis Prev Control*. 2023;1(1):13-19.
7. Pauzi FA, Sahathevan S, Khor BH, et al. Exploring metabolic signature of protein energy wasting in hemodialysis patients. *Metabolites*. 2020;10(7):1-16.
8. Post A, Groothof D, Schutten JC, et al. Fibroblast growth factor 21 and protein energy wasting in hemodialysis patients. *Clin Nutr*. 2021;40(6):4216-4224.
9. Dam M, Hartman EA, Kruizenga H, van Jaarsveld BC, Weijs PJM. Are we overfeeding hemodialysis patients with protein? Exploring an alternative method to estimate protein needs. *Clin Nutr ESPEN*. 2021;44:230-235.

E-ISSN: 2528-410X

10. Patoc GR, Fajutag JD, Blanco JLJ, Villanueva ART, Briones MVA. Diagnostic value of the handgrip strength in detecting protein-energy wasting among patients on maintenance hemodialysis at National Kidney and Transplant Institute, Philippines. *Clin Nutr Open Sci*. 2024;55:48-56.

11. Hayati DM, Widiany FL, Nofiartika F. Status gizi berdasarkan dialysis malnutrition score (DMS) dengan kualitas hidup pasien hemodialisis. *J Gizi Klin Indones*. 2021;18(1):28.

12. Maharja R, Ananda F, Latief AWL, Ananda R, Shabir AM, Hidayat LO. Kebutuhan Kalori Pekerja di Perusahaan Kontraktor Alat Berat. *Nutr Sci Heal Res*. 2023;1(2):28-32.

13. Gerhana Juniar Ekaputri TAK. Hubungan Asupan Energi dan Protein Terhadap Status Gizi Pasien Penyakit Ginjal Kronik Dengan Hemodialisa. *J Nutr Culin*. 2022;2.

14. M.Riyan Hidayat AM. Makanan Sehat Dan Halal Dalam Al-Qur'an. *J Stud Quran Hadis Al-Dhikra*. 2021;3:161-176.

15. Maulida NR, Rahayu LS, Andengganan Y, Bina S Al. Kecukupan Asupan Gizi Dalam Peningkatan Status Gizi Pasien Hemodialisis Berdasarkan Dialysis Malnutrition Scores. *J Uhamka*. 2019;4(1):28-36.

16. Maigoda TC, Maisyorah E, Krisnasary A, Ardiansyah S. Energy, protein, and potassium intake with nutritional status among chronic renal failure patients undergoing hemodialysis in hospital Dr. M.Yunus, Bengkulu, Indonesia. *Ann Trop Med Public Heal*. 2020;23(08).

17. Mak RH, Iyengar A, Wang AYM. Nutrition Management for Chronic Kidney Disease: Differences and Special Needs for Children and Adults. *Semin Nephrol*. 2023;43(4):151441.

18. Rahman T, Khor BH, Sahathevan S, et al. Protein Energy Wasting in a Cohort of Maintenance Hemodialysis Patients in Dhaka, Bangladesh. *Nutrients*. 2022;14(7):1-13.

19. Sherly, Putra DA, Siregar A, Yuliantini E. Asupan Energi, Protein, Kalium dan Cairan dengan Status Gizi (SGA) Pasien GGK yang Menjalani Hemodialisa. *J Gizi dan Kesehat*. 2021;5(2):211-220.

20. Anggini R, Suryani D, Natan O. Analysis of Energy and Protein Intake with Nutritional Status of Chronic Kidney Failure Patients with Hemodialysis at Harapan and Doa Regional Hospital, Bengkulu City. *Int*

E-ISSN: 2528-410X

J Med Sci Clin Res Stud. 2023;03(10).

21. Kizil M, Merve Tengilimoglu-Metin M, Gumus D, Sevim S, Turkoglu I, Mandiroglu F. Dietary inflammatory index is associated with serum C-reactive protein and protein energy wasting in hemodialysis patients: A cross-sectional study. *Nutr Res Pract*. 2016;10(4):404-410.

22. Orozco-González CN, Márquez-Herrera RM, Cortés-Sanabria L, et al. Severity of protein-energy wasting and obesity are independently related with poor quality of life in peritoneal dialysis patients. *Nefrologia*. 2022;42(2):186-195